

CASE REPORT

SURGICAL STABILISATION OF SACROILIAC FRACTURE-LUXATION WITH A LAG-SCREW IN A CAT

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ABSTRACT. An intact male, 2.5 kg, 1 ½ years old Domestic Long Hair (DLH) cat was brought to the University Veterinary Clinic, Universiti Malaysia Kelantan with the complaint of inability to stand and inappetence since it was hit by a car a day before presentation. Physical examination and radiography revealed multiple fractures including fracture of the pubis, fracture of the left ischium and fracture of the right femoral neck. There was also a left sacroiliac fracture-luxation. The cat was stabilized with intravenous fluid using normal saline, analgesic, non-steroidal anti-inflammatory and antibiotic drugs. The sacroiliac fracture-luxation was repaired using a lag screw. The surgical site developed swelling due to seroma formation post operatively, where a drainage tube was placed which necessitated daily wound cleaning and dressing. The cat was able to ambulate with satisfactory weight bearing of the hind limbs at 10 days post-surgery and four weeks later, the cat demonstrated improvement in gait. At 5-months post-surgery, the cat was completely back to its normal gait and ambulation normally.

Keywords: Feline, sacroiliac, lag screw, pelvic fracture, lameness

INTRODUCTION

Pelvic fractures are a common complaint in domestic cats, accounting for 22-32 % of fracture cases presented to the veterinary facilities (Bookbinder and Flanders, 1992; Piermattei *et al.*, 2006; Smith, 2004; Hill, 1977). Significant trauma is necessary to cause fracture of the pelvic bones (Bookbinder and Flanders, 1992). Fractures can involve the sacroiliac joint, ilial body, acetabular, pelvic floor and the pelvic margin (Messmer and Montavon, 2004). Approximately 60% of cats with pelvic fractures have sustained a sacroiliac luxation or fracture-luxation (Bookbinder and Flanders, 1992). The indications for surgical

repair are pain and lameness, bilateral injuries, neurological deficits, and displacement exceeding 50% of the length of the sacroiliac joint surface (Voss *et al.*, 2013). The classical and commonly used stabilization method is insertion of a lag screw from the lateral aspect of the iliac wing across the sacroiliac joint into the sacral body that compresses and realigns the sacroiliac joint (DeCamp, 2005; Voss *et al.*, 2013). A cat with fracture-luxation of left sacroiliac joint, fractures involving pubis, left ischium and right femoral neck was treated with open reduction and stabilization of sacroiliac joint with a lag screw which enabled the animal to ambulate in ten days post-surgery.

CASE REPORT

An intact 2.5 kg, 1 ½ years old Domestic Long Hair (DLH) male cat was presented to the University Veterinary Clinic, Universiti Malaysia Kelantan (KVUMK) after being hit by a car one day prior and was unable to stand. The cat has been anorexic since then. The cat was first taken to a primary veterinarian where it was given analgesics and calcium supplement to boost and strengthen its bone reparations. The following day, the cat remained recumbent, off feed and did not defecate. Hence, the cat was referred to KVUMK for further examination and treatment. The cat was an indoor cat fed with kibbles. Vaccination was up to date, but deworming status was unknown.

Upon clinical examination, the cat was calm, alert and responsive. Temperature, respiratory rate and pulse rates were within normal limits; however, its body was 5% dehydrated. Mucous

membrane was pale and capillary refilling time (CRT) was 3 seconds, which was slightly delayed. The body condition score (AAHA nutritional assessment guideline for dogs and cats 2010) was 2/5 and the cat had bilateral submandibular lymph nodes enlargement. The cat was reluctant to walk with grade-6 lameness based on Modified Sumner-Smith lameness score (Sumner-Smith, 1993). Warm and painful swelling was noticed at the left sacroiliac region and right hip joint. Crepitus was felt at the proximal part of the right femur. There was no evidence of wounds on the body and the cat was neurologically sound. Diagnostic workup included complete blood count and radiographic examination. Complete blood count revealed granulocytic leukocytosis, normocytic hypochromic anemia and thrombocytopenia which was transient (Table 1). There was no evidence of co-morbidities.

Table 1. Blood profile on the day of hospitalisation and four days later/ prior to surgery

Parameter	Result		Normal range
	Day of hospitalization	Day of surgery	
WBC 10 ³ /µl	21.0 H	20.1 H	6.0-15.5
LYM 10 ³ /µl	6.7	4.6 L	5.7-8.9
MON 10 ³ /µl	2.5	2.5	2.2-4.0
GRA 10 ³ /µl	17.8 H	15.0 H	2.0-8.0
RBC 10 ³ /µl	6.79	7.69	6.50-10.0
HGB g/dl	9.9 L	11 L	10.0-15.0
HCT %	34.7	40.7	30.0-45.0
MCV µm ³	51.1	52.9	39.0-55.0
MCH pg	14.6 L	14.3 L	25.9-34.0
MCHC g/dl	28.5 L	27.0 L	30.0-45.0
RDW %	14.3	15.3	10-16.0
PLT 10 ³ /µl	254 L	166 L	300-800
MPV µm ³	8.9	9.1	7.0-11.0
PCT %	0.226	0.151 L	0.2-0.5
PDW %	28.4 H	40.7 H	10.0-18.0

Radiographs revealed fracture-luxation of left sacroiliac joint with cranioventral displacement of the left iliac wing, complete transverse fracture of the right femoral neck with cranio-dorsal displacement; comminuted fracture of floor of pubis and left ischium (Figures 1A and 1B). The initial medications instituted to stabilize the cat upon hospitalization were normal saline 250 ml (10 drops/min intravenous) daily, methylprednisolone (1.1 mg/kg intramuscular) once, meloxicam (0.3 mg/kg subcutaneous) once daily for 4 days, ranitidine (2.5 mg/kg intravenous) twice daily for 2 days, tramadol (3 mg/kg intravenous) once daily for 5 days, amoxicillin/clavulanic acid (8.75 mg/kg subcutaneous) once daily for 2 days, methylcobalamine (500 mcg) 1 tablet daily for 4 days and lactulose 1 ml orally twice daily for 3 days. At this point, the cat was clinically stable with normal rectal temperature (38.2°C).

Sacroiliac fracture-luxation repair was carried out on the 4th day of hospitalization and the surgical approach was according to the procedure described by Johnson (2014).

The patient was premedicated intravenously with tramadol (4 mg/kg), midazolam (0.3 mg/kg) and meloxicam (0.3 mg/kg). Amoxicillin trihydrate and clavulanic acid (8.75 mg/kg) was administered subcutaneously pre-operative. Isoflurane was used for anaesthetic induction at 5% and maintained at 2.5%.

Following aseptic preparation of the surgical site, the patient was positioned in right lateral recumbency to approach the wing of the left ilium and dorsal aspect of the sacrum. Skin incision was made beginning from over the cranial dorsal left iliac crest and continued caudally and parallel to the spine until the caudal iliac spine. Subcutaneous tissue and pelvic fat were incised along the same line to expose the cranial and caudal dorsal iliac spine. First muscle incision was made along the periosteal origin of middle gluteal muscle to expose lateral surface of ilium and second incision was made along the periosteal origin of sacrospinalis muscle which was already disrupted due to the initial trauma, to expose the medial surface of ilium. Ilium was exposed and the muscles were



Figure 1. Preoperative ventrodorsal (a) and lateral (b) view radiographs of pelvis and femur showing left sacro-iliac luxation, pelvic floor fracture and right femoral neck fracture.

retracted using an army-navy retractor. Ilium was retracted further ventrally with a bone holding forceps to expose the crescent shaped articular cartilage and fibrocartilaginous joint surface of the sacrum.

A small upper part of the crescent shaped hyaline cartilage was found missing but it did not affect the procedure. Insertion point for the screw was located as a craniodorsal location to the crescent shaped hyaline cartilage. A 2.0 mm drill bit was used to drill a thread hole into the sacrum. Tapping was done using a 2.7 mm tap. A glide hole was drilled using a 2.7 mm drill bit in the iliac wing once the proper location was determined by palpating the articular roughened area on the medial surface of the iliac wing. The luxation was reduced, and fixation was carried out using a 20 mm long 2.7 mm cortical screw. Stability of the joint was ascertained. Superficial fascia of the sacrospinalis and middle gluteal muscles were sutured together using Ecosorb 3-0 Poly (Glycolide-co-Lactide) in an interrupted suture pattern. This was followed by the closure of the gluteal fascia and the subcutaneous tissue

in a simple continuous pattern. The skin was apposed using Ecosorb 4-0 with intradermal pattern.

Immediate post-operative radiographs revealed successful lag screw placement with satisfactory reduction and stabilisation. There was restoration of the left hemipelvis to its normal alignment with the right hemipelvis (Figures 2A and 2B). The drugs administered postoperatively were tramadol (3 mg/kg intravenous) as analgesic and meloxicam (0.3 mg/kg intravenous) as anti-inflammatory. Antibiotic therapy was given with clindamycin (11 mg/kg orally every 24 hours) for 10 days. Nerve supplement (cyanocobalamin 0.02 mg/kg orally every 12 hours) was also given. Lactulose was given as stool softener.

Three days post-surgery, there was presence of serous discharge from the suture site. Drainage tube was placed and retained for 3 days. Wound dressing was done on a daily basis. The pressure sore developed at the right hip region showed signs of healing. The cat was discharged on the 10th day post-hospitalization. On the day of discharge, the cat was able to bear weight



Figure 2. Post-operative ventrodorsal (a) and lateral (b) view radiographs of pelvis showing the lag screw placement.

on both the hind limbs, satisfactorily ambulate although there was occasional stumbling. The cat was further prescribed with amoxicillin and clavulanic acid (8.75 mg/kg every 12 hours for 7 days), cyanocobalamin (0.02 mg/kg orally every 12 hours for 10 days), carica papaya proteolytic enzymes (1 tab every 12 hours for 7 days), lactulose ((1 ml per oral every 12 hours for 10 days) and liverferol (1 ml every 12 hours for 10 days). The owner was advised to apply silver sulfadiazine cream on the wound twice daily for 10 days.

Post-surgery care was advised for the cat which involved cage rest for one month, monitoring of the incision site for any sign of infection (warmness or discharge) and rehabilitation with passive range movements to hind limb joints. There was a plan to perform right femoral head and neck ostectomy (Excision Arthroplasty) after 3 weeks. The cat was reviewed at 30 days and 5 months post-surgery, where the cat was observed to ambulate well without any sign of lameness.

DISCUSSION

Pelvic fractures account for approximately 32% of all feline fractures (Bird and de Vicente, 2020), which are common injuries in cats. Orthopedic examination, gait analysis, palpation, neurological examination and radiographs aid in the diagnosis of pelvic fractures. Multiple view radiographs are essential to identify the pelvic fractures because generally it involves more than one bone. Some cases are treated conservatively and depend on the severity of the cases (Bird and de Vicente, 2020; Rodriguez *et al.*, 2020).

Multiple surgical techniques are reported in the literature for internal fixation of pelvic fracture including bone plating, lag screw fixation, external skeletal fixation and pin fixation (Burton, 2011). Surgical repair was decided in this case

because of bilateral and multiple injuries with non-weight bearing lameness of hind limbs and also the displacement of the luxated sacroiliac joint surface which exceeded 50% (DeCamp, 2005; Voss *et al.*, 2013). Anatomic guidelines have been published for correct screw placement for sacroiliac luxation in the cat (Burger *et al.*, 2004). The dorsolateral approach to the sacrum and iliac wing was followed to insert the lag screw through the lateral aspect of the iliac body and to stabilize the luxated sacroiliac joint (Johnson, 2014). Visualization of the sacroiliac joint was excellent with this aforementioned approach (Voss *et al.*, 2013).

DeCamp and Braden (1985) and Burger *et al.* (2005) have stated that knowledge of regional anatomy and correct positioning of the screw are required for sacroiliac lag screw fixation and the screw should penetrate at least 50-60% of the width of the sacrum to prevent screw loosening. Further, Shales *et al.* (2010) recommended screw placement to a depth of 60% of the width of the feline sacrum. DeCamp (2005) had stated that the screw size depends upon the size of the animal and a screw size of 2.0 – 2.7 mm is selected for cats and small dogs. Voss *et al.* (2013) have suggested premeasuring the screw length of 60% of sacral width from ventro-dorsal radiograph, which is usually around 20–24 mm.

In this case study, 2.7 mm screw with 20 mm length was used, based on the assessment of the preoperative radiographs where the size was found suitable for the cat. Furthermore, the screw penetrated more than 50% of the width of the sacrum and hence, resulted in stable fixation and there was no evidence of screw loosening after one month follow up, even though surgical repair was not done for the fractured right femoral neck. Consequently, the cat's gait was back to normal five months post-surgery, suggesting stability of the left sacroiliac joint provided by the lag screw and good healing.

Cage rest would have assisted for fibrous healing and in turn stability at the right femoral neck fracture site. Since the cat was using the right hind limb satisfactorily and the suggested excision arthroplasty involved hospitalization and cost, the owner at that stage decided not to hospitalize the cat for further treatment and surgery. Burger *et al.* (2005) have stated that neurological deficits of the sciatic nerve and voiding dysfunction are observed in approximately 20 % of cats with sacroiliac luxation. However, in the present cat, there was no neurological deficit, the probable reason that supported and hastened early recovery after surgical intervention.

Even though the cat suffered with multiple injuries and fractures i.e., left sacroiliac luxation with fractures of pubis, fracture of ischium and fracture of right femoral neck (Figure 1A and 1B) with non-weight bearing lameness of hind limbs, it started ambulating in 10 days post-surgery. The cat showed further improvement during the follow up period until 5 months. Multiple factors influenced the healing such as the initial medical management, early surgical repair with a lag screw for the luxated sacroiliac joint followed by cage rest and physical rehabilitation.

CONCLUSION

A cat reported multiple pelvic injuries, which included left sacroiliac luxation, fractures of pubis, fracture of ischium and fracture of right femoral neck was treated with the lag screw fixation for sacro iliac luxation followed by cage rest and rehabilitation. The animal started ambulating in 10 days post-surgery, indicating suitable and successful treatment method.

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